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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/677,549	10/01/2003	Adam L. Cohen	P-US002-H-SC	9534

32107 7590 03/31/2006

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EXAMINER	
VAN, LUAN V	
ART UNIT	**PAPER NUMBER**
1753	

DATE MAILED: 03/31/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

W

Office Action Summary	**Application No.** 10/677,549	**Applicant(s)** COHEN, ADAM L.	
	Examiner Luan V. Van	**Art Unit** 1753	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on 02 February 2006.
2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.
3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-26 is/are pending in the application.
  4a) Of the above claim(s) _____ is/are withdrawn from consideration.
5)☐ Claim(s) _____ is/are allowed.
6)☒ Claim(s) 1-26 is/are rejected.
7)☐ Claim(s) _____ is/are objected to.
8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.
10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.
  Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
  Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
  a)☐ All b)☐ Some * c)☐ None of:
    1.☐ Certified copies of the priority documents have been received.
    2.☐ Certified copies of the priority documents have been received in Application No. _____.
    3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
  * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claims 1-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Guckel in view of Hunter et al..

Regarding claims 1-3 and 7-9, Guckel teach a method for fabricating a multi-layer three-dimensional structure, comprising: (i) forming a first layer, comprising: a) providing a first mask 33 (figure 1) in contact with a substrate 30, wherein the mask has a first pattern of openings therein (figure 2); b) depositing a first pattern of a first material 34 from a source of the first material onto said substrate using the first mask to form a portion of a first layer, wherein the first material comprises a structural material; c) removing the first mask (column 3 lines 2 -6) from the substrate; d) depositing a second material 36 onto the substrate, wherein the second material comprises a sacrificial material; (ii) building additional layers adjacent to and adhered to previously formed layers (column 4 lines 3-15); and (iii) removing undesired elements of structural material from at least the first layer via machining (column 3 lines 12-18). Furthermore, Guckel teach "The machining, e.g., mechanical grinding or milling, achieves a substantially flat, uniform surface extending across both the primary and secondary metals, and allows the thickness of the first layer of primary metal to be closely controlled, and particularly allows the exposed surface of the primary metal to be formed substantially smooth. In contrast, an electroplated metal by itself before machining shows an uneven surface which is not well controlled in thickness. Moreover, a smooth surface for the first layer of the primary metal is better suited to receive an electroplated second layer thereon than the rough surface of an as-plated metal" (column 3 lines 12-23).

Guckel differs from the instant claims in that the reference teach removing a portion of the structural material by machining instead of etching or electropolishing.

Hunter et al. teach:

> "...method for producing a three dimensional object, particularly suited to microfabrication applications. The method includes the steps of providing a substrate with a conducting interface, an electrode having a feature or features that are small relative to the substrate, and a solution. The solution has a reactant that will either etch the substrate or deposit a selected material in an electrochemical reaction. The electrode feature is placed close to but spaced from the interface. A current is passed between the electrode and the interface, through the solution, inducing a localized electrochemical reaction at the interface, resulting in either the deposition of material or the etching of the substrate. Relatively moving the electrode and the substrate along a selected trajectory, including motion normal to the interface, enables the fabrication of a three dimensional object. In an alternative embodiment, current is passed through an orifice placed close to but spaced from the substrate surface, and may be accompanied by forced convection through the orifice. The method provides the potential to fabricate

using many materials, including metals, alloys, polymers and semiconductors in three dimensional forms and with sub-micrometer spatial resolution." (Abstract).

With respect to chemical etching, Hunter et al. teach:

"In etching the surface to form a three dimensional object, the procedure is almost the same as described for deposition. The solution is chosen such that, in an electrochemical reaction, the substrate is etched, rather than material deposited. Furthermore, etching is performed along a trajectory that contains a component normal to and towards the substrate surface." (Column 4 line 65 -- column 5 line 4).

With respect for electropolishing, Hunter et al. teach:

"An oxidation or reduction potential is applied to induce deposition, FIG. 1, or etching, FIG. 2, once the electrode 11 is properly positioned. Either a voltage supply or a current source connected between the electrode 11 and the substrate 10 may be employed. The appropriate potential depends on the reactant(s) and results in a deposition 14 or etching 15." (Column 8 lines 23-28).

Addressing claims 1, 5-6 and 8-9, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the method of Guckel by etching or electropolishing the structural material as taught by Hunter et al., because it would reduce the surface roughness of the structure material (column 7 lines 1-4), thus enhancing the uniformity of subsequent deposited layers.

Regarding claim 4, since "first metal" and "second metal" is an arbitrary designation assigned to a material, the first metal of the instant claim can be the secondary or sacrificial metal of Guckel, and similarly, the second metal can be the primary or structural metal of Guckel. Even if "first" and "second" imply a sequence or order of deposition, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the method of Guckel by reversing the order of the deposition, such as depositing the sacrificial material first followed by the sacrificial material. Reversing the order of the prior art process steps or selection of any order of performing process steps is *prima facie* obvious in the absence of new or unexpected results. (*Ex parte Rubin*, 128 USPQ 440 (Bd. App. 1959). See also *In re Burhans*, 154 F.2d 690, 69 USPQ 330 (CCPA 1946).

Regarding claim 10-11, Guckel teach removing a portion of the deposited material in which removing is is performed during a process of planarizing a surface of the first layer (column 3 lines 9-20).

Regarding claim 12-13, Guckel teach releasing the structural material from the sacrificial material after formation of the multi-layer structure (column 5 lines 16-25). Specific to claim 12, as noted above, reversing the order of the prior art process steps or selection of any order of performing process steps is *prima facie* obvious in the absence of new or unexpected results. (*Ex parte Rubin*, 128 USPQ 440 (Bd. App. 1959). See also *In re Burhans*, 154 F.2d 690, 69 USPQ 330 (CCPA 1946).

Regarding claim 14-16 and 18-22, Guckel teach a method for fabricating a multi-layer three-dimensional structure, comprising: (i) forming a first layer, comprising: a) providing a first mask 33 (figure 1) in contact with a substrate 30, wherein the mask has a first pattern of openings therein (figure 2); b) depositing a first pattern of a first material 34 from a source of the first material onto said substrate using the first mask to form a portion of a first layer, wherein the first material comprises a structural material; c) removing the first mask (column 3 lines 2 -6) from the substrate; d) providing a second mask 39 (figure 6) in contact with the substrate, and/or first material, wherein the mask has a second pattern of openings therein; f) removing the second mask (column 5 lines 50-54) from the substrate and/or first material; and (ii) building layers adjacent to and adhered to previously formed layers (column 4 lines 3-15), wherein at least one of first or second materials is a structural material and removing an undesired portion of the structural material via a machining operation. Furthermore, Guckel teach "The machining, e.g., mechanical grinding or milling, achieves a substantially flat, uniform surface extending across both the primary and secondary metals, and allows the thickness of the first layer of primary metal to be closely controlled, and particularly allows the exposed surface of the primary metal to be formed substantially smooth. In contrast, an electroplated metal by itself before machining shows an uneven surface which is not well controlled in thickness. Moreover, a smooth surface for the first layer of the primary metal is better suited to receive an electroplated second layer thereon than the rough surface of an as-plated metal" (column 3 lines 12-23).

Guckel differs from the instant claims in that the reference teach removing a portion of the structural material by machining instead of etching or electropolishing; Guckel also differs from the instant claims in that the reference does not explicitly teach forming a void into the substrate and depositing into the void.

Hunter et al. teach teach the method as described above. In addition, Hunter et al. teach etching the substrate to create a void for forming a three-dimensional object (figures 2 a-d).

Addressing claims 14, 18-19 and 21-22, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the method of Guckel by etching or electropolishing the structural material as taught by Hunter et al., because it would reduce the surface roughness of the structure material (column 7 lines 1-4), thus enhancing the uniformity of subsequent deposited layers. Addressing claim 14, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have further modified the method of Guckel by etching a void and depositing into the void as taught by Hunter et al., because it would form electrical connections suitable for an integrated circuit.

Regarding claim 17, since "first metal" and "second metal" is an arbitrary designation assigned to a material, the first metal of the instant claim can be the secondary or sacrificial metal of Guckel, and similarly, the second metal can be the primary or structural metal of Guckel. Even if "first" and "second" imply a sequence or order of deposition, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the method of Guckel by reversing the order of the deposition, such as depositing the sacrificial material first followed by the sacrificial material. Reversing the order of the prior art process steps or selection of any order of performing process steps is *prima facie* obvious in the absence of new or unexpected results. (*Ex parte Rubin*, 128 USPQ 440 (Bd. App. 1959). See also *In re Burhans*, 154 F.2d 690, 69 USPQ 330 (CCPA 1946).

Regarding claim 23-24, Guckel teach removing a portion of the deposited material in which removing is is performed during a process of planarizing a surface of the first layer (column 3 lines 9-20).

Regarding claim 25-26, Guckel teach releasing the structural material from the sacrificial material after formation of the multi-layer structure (column 5 lines 16-25). Specific to claim 25, as noted above, reversing the order of the prior art process steps or selection of any order of performing process steps is *prima facie* obvious in the absence of new or unexpected results. (*Ex parte Rubin*, 128 USPQ 440 (Bd. App. 1959). See also *In re Burhans*, 154 F.2d 690, 69 USPQ 330 (CCPA 1946).

Double Patenting

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970);and, *In re Thorington,* 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

Claims 1-26 are provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-28 of copending Application No. 10841378 in view of Hunter et al.. This is a provisional double patenting rejection since the conflicting claims have not in fact been patented.

Regarding claims 1-26 the copending application claims the following method:

A method for fabricating a multi-layer three-dimensional structure, comprising: (i) forming a first layer, comprising: providing a first mask (claim 5) in contact with a substrate, wherein the mask has a first pattern of openings therein (claim 1); depositing a first pattern of a first material from a source of the first material onto said substrate using the first mask to form a portion of a first layer, wherein the first material comprises a structural material or sacrificial material (claim 5); providing a second mask in contact with the substrate (claim 8); etching a void into the substrate (claim 14); and (ii) building layers adjacent to and adhered to previously formed layers (claim 1), wherein at least one of first or second materials is a structural material and removing an undesired portion of the structural material via a planarizing operation (claim 12). The first and second mask are inherently removed from the substrate, since the first and second mask are used for depositing different materials, i.e., structural and sacrificial material.

The claims in the copending application differ from the instant claims in that the copending application claims removing a portion of the deposited materials by planarizing instead of etching or electropolishing.

Hunter et al. teach:

> "...method for producing a three dimensional object, particularly suited to microfabrication applications. The method includes the steps of providing a substrate with a conducting interface, an electrode having a feature or features that are small relative to the substrate, and a solution. The solution has a reactant that will either etch the substrate or deposit a selected material in an electrochemical reaction. The electrode feature is placed close to but spaced from the interface. A current is passed between the electrode and the interface, through the solution, inducing a localized electrochemical reaction at the interface, resulting in either the deposition of material or the etching of the substrate. Relatively moving the electrode and the substrate along a selected trajectory, including motion normal to the interface, enables the fabrication of a three dimensional object. In an alternative embodiment, current is passed through an orifice placed close to but spaced from the substrate surface, and may be accompanied by forced convection through the orifice. The method provides the potential to fabricate using many materials, including metals, alloys, polymers and semiconductors in three dimensional forms and with sub-micrometer spatial resolution." (Abstract).

With respect to chemical etching, Hunter et al. teach:

> "In etching the surface to form a three dimensional object, the procedure is almost the same as described for deposition. The solution is chosen such that, in an electrochemical reaction, the substrate is etched, rather than material deposited. Furthermore, etching is performed along a trajectory that contains a component normal to and towards the substrate surface." (Column 4 line 65 -- column 5 line 4).

With respect for electropolishing, Hunter et al. teach:

> "An oxidation or reduction potential is applied to induce deposition, FIG. 1, or etching, FIG. 2, once the electrode 11 is properly positioned. Either a voltage supply or a current source connected between the electrode 11 and the substrate 10 may be employed. The appropriate potential depends on the reactant(s) and results in a deposition 14 or etching 15." (Column 8 lines 23-28).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the method of the copending application by etching or electropolishing the structural material as taught by Hunter et al., because it would reduce the surface roughness of the structure material (column 7 lines 1-4), thus enhancing the uniformity of subsequent deposited layers.

Claims 1-26 are provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-107 of copending Application No. 10841272 in view of Hunter et al.. This is a provisional double patenting rejection since the conflicting claims have not in fact been patented.

Regarding claims 1-26 the copending application claims the following method:

A method for fabricating a multi-layer three-dimensional structure, comprising: (i) forming a first layer, comprising: providing a first mask (claim 1) in contact with a substrate, wherein the mask has a first pattern of openings therein (claim 1); depositing a first pattern of a first material from a source of the first material onto said substrate using the first mask to form a portion of a first layer, wherein the first material comprises a structural material or sacrificial material (claim 43); providing a second mask in contact with the substrate (claim 8); etching a void into the substrate (claim 1); and (ii) building layers adjacent to and adhered to previously formed layers (claim 1), wherein at least one of first or second materials is a structural material and removing an undesired portion of the structural material via a planarizing operation (claim 1). Since the designation of "first" and "second" is arbitrarily assigned to the mask for depositing the structural or sacrificial material, the first and second mask are inherently present when the structural and sacrificial material are selectively deposited; the first and second mask can be the same or different masks. The first and second mask are inherently removed from the substrate, since the first and second mask are used for depositing different materials, i.e., structural and sacrificial material.

The claims in the copending application differ from the instant claims in that the copending application claims removing a portion of the deposited materials by planarizing instead of etching or electropolishing.

Hunter et al. teach the method as described above.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the method of the copending application by etching or electropolishing the structural material as taught by Hunter et al., because it would reduce the surface roughness of the structure material (column 7 lines 1-4), thus enhancing the uniformity of subsequent deposited layers.

Claims 1-26 are provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-20 of copending Application No. 10 724515 in view of Hunter et al.. This is a provisional double patenting rejection since the conflicting claims have not in fact been patented.

Regarding claims 1-26 the copending application claims the following method:

A method for fabricating a multi-layer three-dimensional structure, comprising: (i) forming a first layer, comprising: providing a first mask (claim 1) in contact with a substrate, wherein the mask has a first pattern of openings therein (claim 1); depositing a first pattern of a first material from a source of the first material onto said substrate using the first mask to form a portion of a first layer, wherein the first material comprises a structural material or sacrificial material (claim 1); providing a second mask in contact with the substrate (claim 8); etching a void into the substrate (claim 1); and (ii) building layers adjacent to and adhered to previously formed layers (claim 1), wherein at least one of first or second materials is a structural material and removing an undesired portion of the structural material via a planarizing operation (claim 9). Since the designation of "first" and "second" is arbitrarily assigned to the mask for depositing the structural or sacrificial material, the first and second mask are inherently present when the structural and sacrificial material are selectively deposited; the first and second mask can be the same or different masks. The first and second mask are inherently removed from the substrate, since the first and second mask are used for depositing different materials, i.e., structural and sacrificial material.

The claims in the copending application differ from the instant claims in that the copending application claims removing a portion of the deposited materials by planarizing instead of etching or electropolishing.

Hunter et al. teach the method as described above.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the method of the copending application by etching or electropolishing the structural material as taught by Hunter et al., because it would reduce the surface roughness of the structure material (column 7 lines 1-4), thus enhancing the uniformity of subsequent deposited layers.

Claims 1-26 are provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-52 of copending Application No. 10 677498 in view of Hunter et al.. This is a provisional double patenting rejection since the conflicting claims have not in fact been patented.

Regarding claims 1-26 the copending application claims the following method:

A method for fabricating a multi-layer three-dimensional structure, comprising: (i) forming a first layer, comprising: providing a first mask (claim 1) in contact with a substrate, wherein the mask has a first pattern of openings therein (claim 1); depositing a first pattern of a first material from a source of the first material onto said substrate using the first mask to form a portion of a first layer, wherein the first material comprises a structural material or sacrificial material (claim 8); providing a second mask in contact with the substrate (claim 8); etching a void into the substrate (claim 1); and (ii) building layers adjacent to and adhered to previously formed layers (claim 1), wherein at least one of first or second materials is a structural material and removing an undesired portion of the structural material via a planarizing operation (claim 9). Since the designation of "first" and "second" is arbitrarily assigned to the mask for depositing the structural or sacrificial material, the first and second mask are inherently present when the structural and sacrificial material are selectively deposited; the first and second mask can be the same or different masks. The first and second mask are inherently removed from the substrate, since the first and second mask are used for depositing different materials, i.e., structural and sacrificial material.

The claims in the copending application differ from the instant claims in that the copending application claims removing a portion of the deposited materials by planarizing instead of etching or electropolishing.

Hunter et al. teach the method as described above.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the method of the copending application by etching or electropolishing the structural material as taught by Hunter et al., because it would reduce the surface roughness of the structure material (column 7 lines 1-4), thus enhancing the uniformity of subsequent deposited layers.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Luan V. Van whose telephone number is 571-272-8521. The examiner can normally be reached on M-F 9:30-6:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam Nguyen can be reached on 571-272-1342. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

LVV
3/28/06

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